CHASE

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CAPITAL INVESTMENTS OF THE WORLD PETROLEUM INDUSTRY

1985
and
1986

Capital Investments of the World Petroleum Industry 1985 and 1986

Global Energy Component

Chase Manhattan Bank, N.A.

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Foreword

For nearly 30 years, the Chase Manhattan Bank, N.A., has published estimates of worldwide capital expenditure in the oil and gas industry. Until this year, Chase has relied on information gathered primarily from a survey of a group of multinational oil companies to determine global expenditure patterns. During the period when this multinational group dominated the world industry, the proportion of expenditure that needed to be indirectly estimated was small. Over the past decade, however, the relative role of these private concerns has declined, as both producing and consuming governments have increased their roles in the world energy markets.

Certainly the most publicized event of this era has been the rise of OPEC and the consequent shift in control of vast oil reserves from the Western multinationals to the producing countries. Concurrent with the rise of OPEC has been the growing strength of national and state-sponsored oil companies, particularly in the developing world. In the consuming countries as well, the role of government has increased; the price shocks of the 1970s resulted in the institution of national energy strategies and government agencies to monitor and execute energy policies. Over the past decade, expenditure data have been gathered by national organizations in an increasingly comprehensive manner.

As the relative role of the Western multinationals has declined and the quality of government data has improved, Chase has determined that its methodology of estimating capital spending can be improved. As a consequence, this year Chase has revised its data-collection procedures to include the more broadly based data sources that are now available. With the publication of this document, Chase will rely largely on data provided by governmental agencies, industry associations and state-sponsored energy concerns. Although confidential company information will be used for certain categories of expenditure, it will play a more limited role than pre-

viously. By relying on source data, largely from government reports, the current methodology presents more balanced and, in certain cases, more detailed estimates. Since the focus of this booklet is on oil industry spending rather than spending by oil companies, estimates for certain categories, like pipelines, chemical plants and marketing, have been eliminated.

To provide a consistent time series of expenditure data based on this new methodology, estimates for the period from 1977 through 1984 have been revised, as shown in Schedule 3 on pages 18-21 of this booklet. Although the current estimates vary from Chase's previous projections in certain categories, these differences are generally not large. Revision of pre-1977 estimates is unwarranted.

Since government data are normally not available until 18 months after the close of the year, the current booklet presents expenditures through 1986. Subsequent editions will reflect a similar lag.

Roger K. Frey

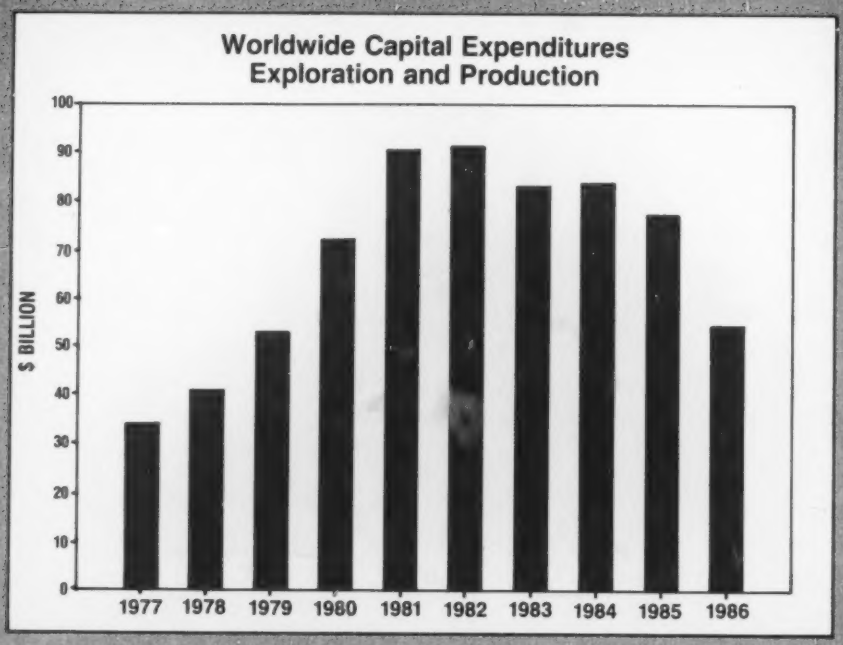
Exploration and Production Spending

Over the 10-year period from 1977 through 1986, worldwide capital spending for exploration and production of oil and gas appears to have followed the rise and fall of crude prices — climbing from $34 billion in 1977 to a peak plateau of $91 billion in 1981 and 1982, declining to $77 billion in 1985, and then dropping sharply to $54 billion in 1986 (see Graph 1, page 6). Although this overall pattern appears to mirror the rising and falling fortunes of the industry, it does distort some of the regional dynamics that influence upstream capital spending. The contrast among three producing areas, the United States, Western Europe and Mexico, illustrates the various forces affecting capital expenditures.

In the United States, the picture is boom and bust. As shown in Graph 2 (page 6), capital spending for exploration and production rose from $17 billion in 1977 to a peak of $55 billion in 1981 and then plummeted to $25 billion in 1986. A great deal of the reason for this close correlation to energy prices is that, in the United States, the private company is the driving force for capital spending. The dynamics of these private companies are straightforward — investment is largely internally financed, so that when prices increase and cash flow improves, the funds are plowed back into capital projects. When prices decline, however, the process is reversed.

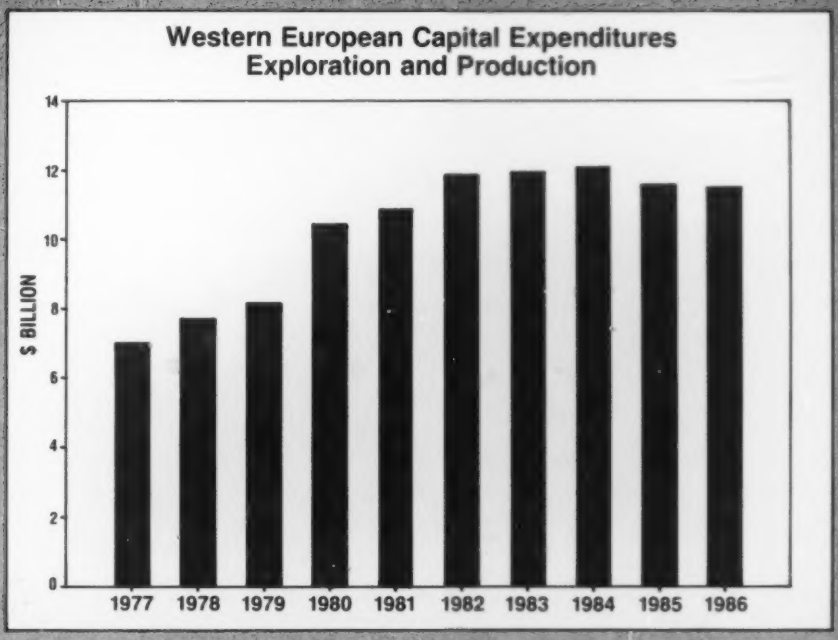
In contrast to the pattern in United States is the expenditure profile for Western Europe. This region, dominated by North Sea investments, has seen expenditures rise from $7 billion in 1977 to a plateau of $11 billion to $12 billion from 1982 through 1986 and seems to be unaffected by the global downturn in the industry (see Graph 3, page 7). No one factor can account for the relative immunity of North Sea spending to the turnabout in oil prices. Certainly government policy, and in particular the revision of the North Sea tax policies, has helped to maintain capital spending. Next, cost cutting and innovation most likely contributed to the survival

Graph 1

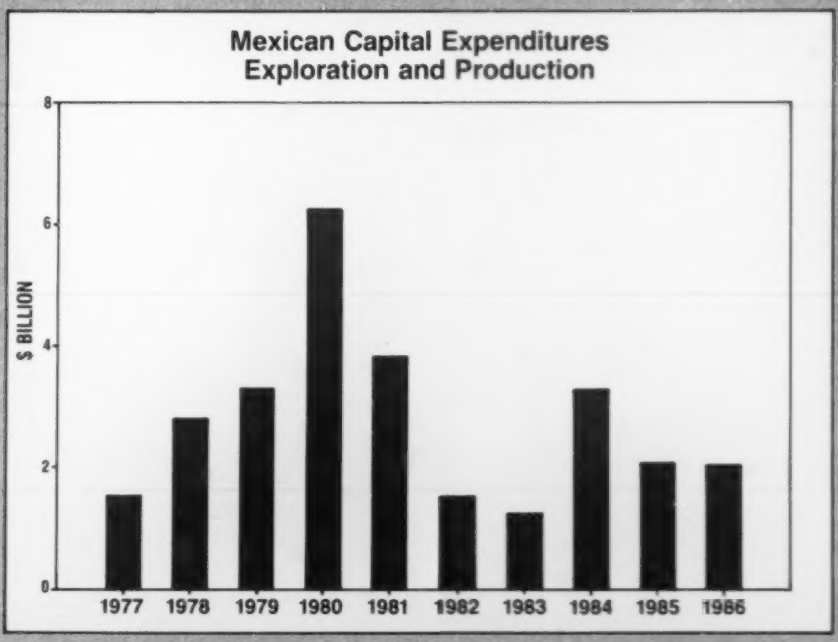


Graph 2

Graph 3



Graph 4



of a number of projects. Another factor, no doubt, is the long lead times required for developments in the North Sea. Construction projects commonly encompass five years or more, and it may turn out that capital expenditures will not fully reflect the oil price collapse of 1986 until the late 1980s or early 1990s. Finally, Western Europe's need to replace natural gas reserves discovered in the 1960s in the North Sea has helped to stabilize capital spending.

Another pattern of capital expenditure is demonstrated by the Mexican experience. As shown in Graph 4 (page 7), the course of Mexican spending appears to be as much related to the internal financial constraints of the central government as to the fortunes of the global oil industry. The low point for Mexican expenditures coincided with the fiscal crisis of 1982-83. Since this time, spending has rebounded modestly as the country's financial difficulties have eased to some degree, even though the oil industry environment has worsened.

In short, the level of exploration and production capital expenditure has been a function of more than the macroeconomics of the industry. Factors such as government policies, project dynamics and international credit availability have also influenced spending patterns.

The United States Oil and Gas Industry: After the Fall — Global and Domestic Contexts

Because, historically, capital spending in the United States has accounted for over half of world capital spending a review of changes in the United States spending patterns in relation to the rest of the world and within the country itself is in order.

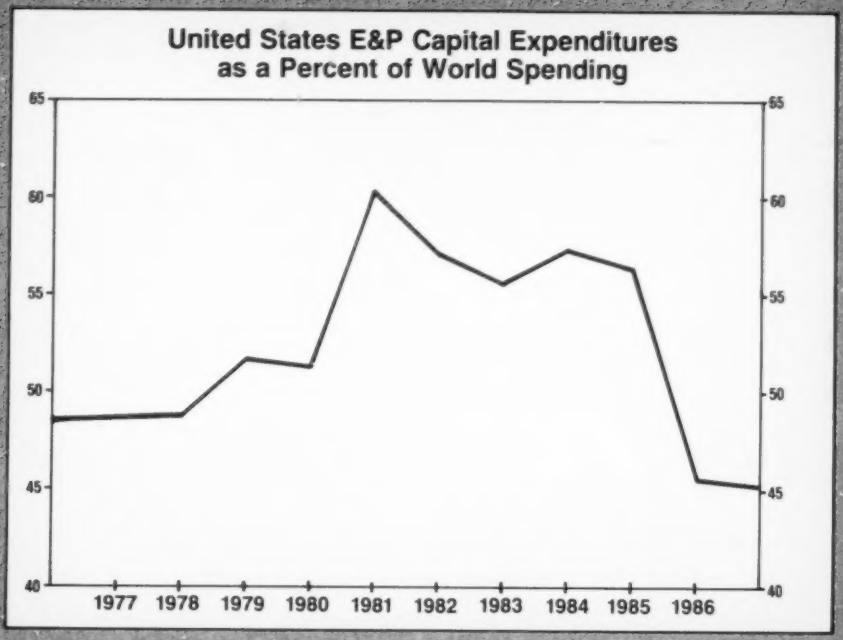
Global Context

Spending for exploration and development in the United States accounted for about 50% of worldwide spending in 1977, increased to 60% in 1981 and has fallen back to under 50% in 1986 (see Graph 5, page 10). Although this pattern implies a cyclical nature, a rebound may not occur for a number of reasons.

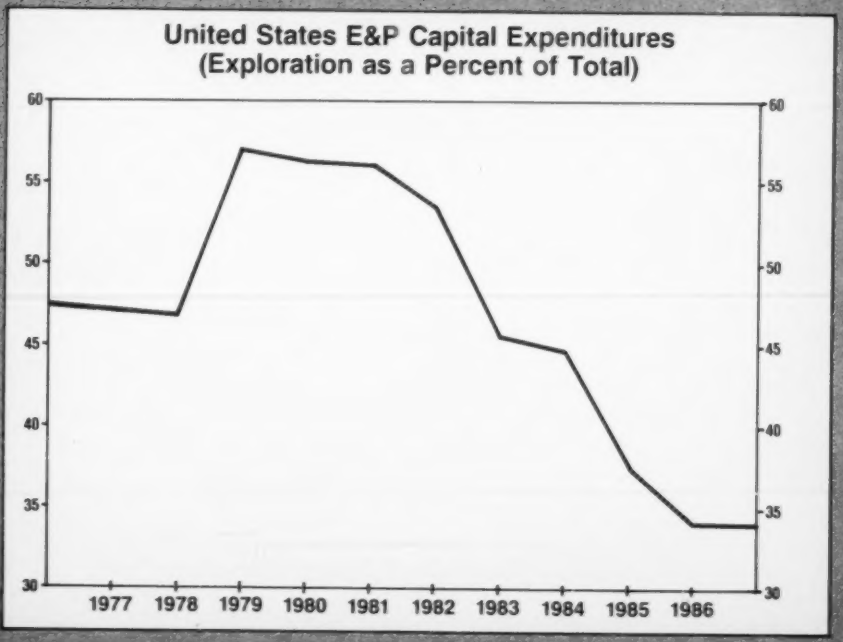
- Geology — With the exception of the Alaskan frontier and some offshore regions, producing basins in the United States are very mature. Thus, despite significant improvement recently, finding costs in the United States are still higher than overseas.
- Economics — Lower energy prices have more adversely affected producing margins in the United States than elsewhere. Foreign governments have generally taxed oil production at higher marginal rates than the United States government has, and the price decrease of 1986 was better cushioned by foreign governments than by the United States government.

  In Chase's publication *Financial Analysis of a Group of Petroleum Companies 1986*, cash margins were derived for the Chase Group of Companies for United States and

Graph 5



Graph 6



foreign production. The following summarizes the effect of the 1986 price decline on government "take" and the companies' cash margin:

Cash Margin, $/BE

	1985	1986	Difference
Government "Take"			
U.S. Production	5.27	0.69	-4.58
Foreign Production	10.21	3.30	-6.91
Company Cash Margin			
U.S. Production	8.05	5.28	-2.77
Foreign Production	6.62	5.24	-1.38

As indicated, foreign governments, with their higher marginal tax rates, absorbed nearly $7 of the price decline, while the U.S. government only absorbed about $5. This tax cushion resulted in a more severe decline in cash margins in the United States than overseas. In 1986, in fact, the U.S. and foreign cash margins were nearly equal; because capital development costs per barrel are generally higher in the U.S. than overseas, this implies a serious deterioration in the rate of return for U.S. capital expenditures. Overall, this shift in economics means that oil development projects overseas will begin to look relatively more attractive.

Domestic Context

Two issues need to be addressed when considering oil and gas capital spending in the United States context. First, how has the price decline affected the allocation of U.S. spending within the industry? Second, in a larger context, how has the price decline affected the relative importance of the oil and gas expenditures in the U.S. economy?

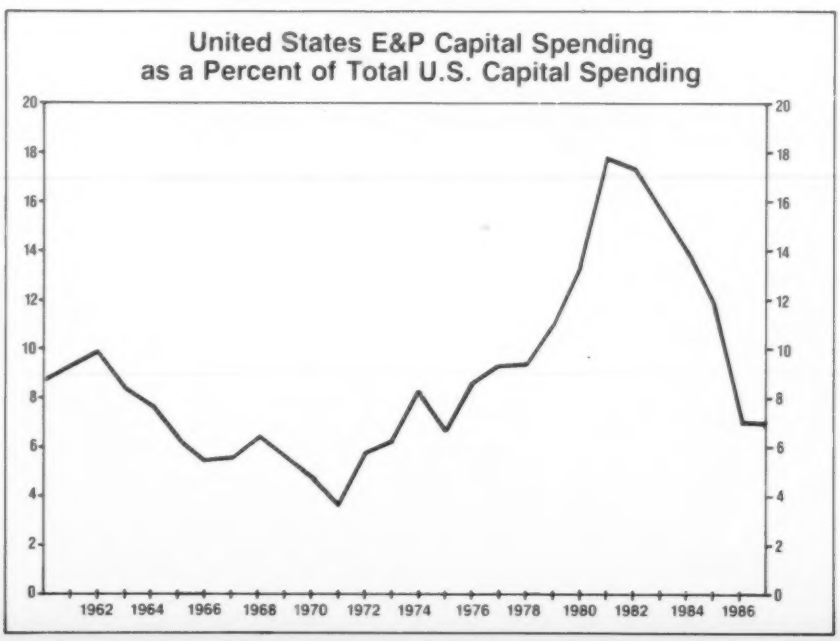
Allocation within the Industry

With regard to the spending pattern of the oil industry within the United States itself, the shifts reflect the dynamics of lower price expectations. First, exploration, which accounted for nearly 60% of total exploration and production spending in 1979-80, has steadily declined to 34% in 1986 (see Graph 6, page 10). This drop in exploration has been accentuated by a number of factors in addition to lower prices. The exploration boom in the early 1980s yielded an inventory of prospects, which the oil companies are still in the process of running down. Next, the price uncertainties of recent years have encouraged management to approve lower risk development projects with short payout periods rather than high-risk wildcats with relatively long payouts. Finally, the precarious credit situations of a number of independents have resulted in a need to produce reserves to repay debt at the expense of exploration.

Relative Importance in U.S. Economy

The oil and gas industry has historically been an important component of capital spending in the United States economy. As shown in Graph 7, capital expenditures in the exploration of oil and gas in the United States as a percentage of total U.S. capital spend-

Graph 7



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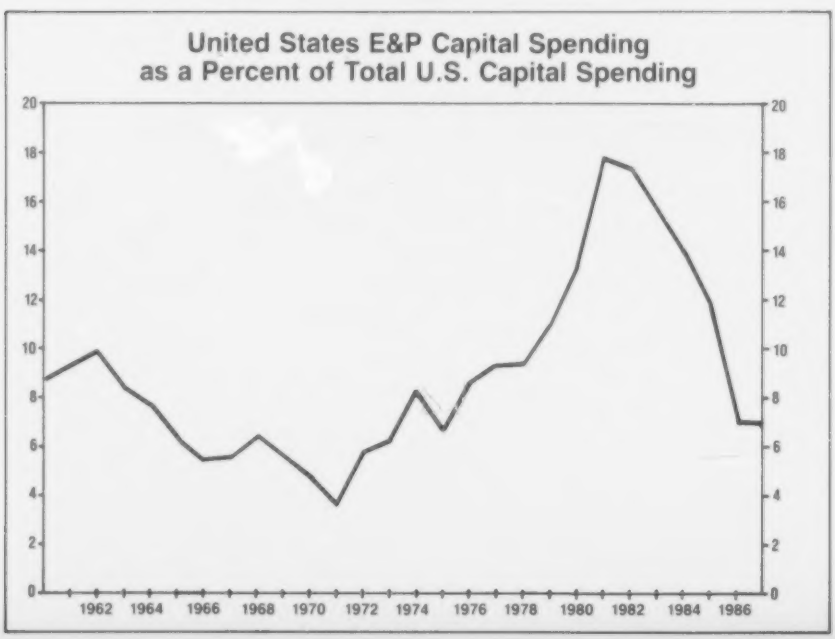

ing have reflected the course of oil prices. From 1961 through 1971, when oil prices were falling in real terms, the oil and gas expenditures fell from 10% to below 4% of total expenditures in the economy. During the oil industry boom from 1973 through 1981, the relative share of this segment increased from this low to a peak of almost 18%. Since 1982, oil and gas expenditures have fallen until, in 1986, the percentage declined to under 7%.

Definitions of Investment Categories

The focus of this annual report is investment in the worldwide oil and gas industry. Consequently, investments in other energy resources such as coal, nuclear or other minerals are excluded. Within the oil and gas industry, funds expended for the acquisition of existing petroleum assets from another entity are not included since the initial expenditures for such assets have been recorded in earlier year investment totals.

For analytic purposes, the industry is divided into five segments:

Crude Oil and Natural Gas

Included in this category are expenditures for the exploration and development of oil and gas reserves. Estimates include both capitalized investments as well as expensed items such as dry hole expenses, intangibles, and general and administrative expenses associated with upstream activities. Excluded are investments in the the transporting, marketing and distribution of natural gas.

Natural Gas Liquid Plants

This category encompasses expenditures for the construction and maintenance of processing plants designed to extract liquids from natural gas.

Liquified Natural Gas (LNG) Plants

Investment in the development of gas reserves, the capital maintenance and construction of LNG plants, and transportation of LNG to the point of tanker loading are included in this category. Not included are investments in LNG tankers, LNG regasification plants and subsequent distribution of gas.

Tankers

This category includes investment in crude oil tankers only.

Refineries

This category is limited to capital investment in the construction and maintenance of refineries only. Expenditures in the marketing and distribution of products outside the refinery gate are not reflected in the totals for this category.

1 Capital and Exploration Expenditures 1984 - 86

	Crude Oil and Natural Gas ($ million)			Refineries ($ million)		
	1984	1985	1986	1984	1985	1986
World	**83,900**	**77,370**	**54,470**	**11,580**	**11,190**	**9,490**
North America	57,550	52,430	31,210	5,620	6,180	4,390
United States[1]	48,060	43,640	24,830	3,030	3,100	2,450
Onshore Lower 48	29,590	26,370	13,310	—	—	—
Offshore Lower 48	9,560	8,620	5,050	—	—	—
Alaska	4,070	2,950	2,020	—	—	—
Canada	6,180	6,690	4,320	570	440	500
Mexico	3,310	2,100	2,060	2,020	2,640	1,440
Western Europe	**12,100**	**11,620**	**11,550**	**1,720**	**1,650**	**1,480**
North Sea	**11,010**	**10,450**	**10,350**	**—**	**—**	**—**
Other	**1,090**	**1,170**	**1,200**	**—**	**—**	**—**
Central & South America	4,750	4,910	4,870	980	850	820
Brazil	1,690	1,680	2,090	n/a	n/a	n/a
Colombia	290	500	200	n/a	n/a	n/a
Venezuela	1,410	1,350	1,310	n/a	n/a	n/a
Other	1,360	1,380	1,270	n/a	n/a	n/a
Far East & Australasia	**4,970**	**4,400**	**3,680**	**2,175**	**1,300**	**1,700**
Australia	**1,270**	**1,230**	**730**	**60**	**45**	**40**
Indonesia	**1,290**	**1,180**	**970**	**n/a**	**n/a**	**n/a**
Japan	**260**	**120**	**70**	**600**	**610**	**1,000**
Other	**2,150**	**1,870**	**1,910**	**850**	**865**	**820**
Middle East & Africa	4,530	4,010	3,160	1,750	990	940

[1]Components may not equal United States totals due, to estimation techniques employed in the U.S. Department of Commerce/A.P.I. surveys.

2 Percent Change In Capital and Exploration Expenditures 1984 - 86

	Crude Oil and Natural Gas			Refineries		
	84/83	85/84	86/85	84/83	85/84	86/85
World	**1%**	**-8%**	**-30%**	**-4%**	**-3%**	**-15%**
North America	8%	-9%	-40%	6%	10%	-29%
United States	4%	-9%	-43%	-19%	2%	-21%
Onshore Lower 48	6%	-11%	-50%	—	—	—
Offshore Lower 48	-11%	-10%	-41%	—	—	—
Alaska	39%	-28%	-32%	—	—	—
Canada	11%	8%	-35%	-36%	-23%	14%
Mexico	163%	-37%	-2%	201%	31%	-45%
Western Europe	**1%**	**-4%**	**-1%**	**-16%**	**-4%**	**-10%**
North Sea	**1%**	**-5%**	**-1%**	**—**	**—**	**—**
Other	**1%**	**7%**	**3%**	**—**	**—**	**—**
Central & South America	-31%	3%	-1%	-17%	13%	30%
Brazil	-31%	-1%	24%	—	—	—
Colombia	4%	72%	-60%	—	—	—
Venezuela	-45%	-4%	-3%	—	—	—
Other	-16%	1%	-8%	—	—	—
Far East & Australasia	**-5%**	**-11%**	**-16%**	**-3%**	**-1%**	**22%**
Australia	**8%**	**-3%**	**-41%**	**-25%**	**-25%**	**-11%**
Indonesia	**-13%**	**-9%**	**-18%**	**—**	**—**	**—**
Japan	**-13%**	**-54%**	**-42%**	**-5%**	**2%**	**64%**
Other	**-7%**	**-17%**	**-1%**	**-1%**	**2%**	**-5%**
Middle East & Africa	-24%	-11%	-21%	-7%	-43%	-5%

3 Capital and Exploration Expenditures 1977 - 86

	1977	1978	1979
		($ million)	
World	**46,180**	**53,380**	**68,600**
Crude Oil and Natural Gas	**34,130**	**41,000**	**53,030**
Natural Gas Liquids Plants	**480**	**520**	**710**
Refineries	**7,210**	**8,790**	**12,220**
Liquified Natural Gas (LNG) Plants	**660**	**120**	**390**
Tankers	**3,700**	**2,950**	**2,250**
North America	24,550	30,440	41,920
Crude Oil and Natural Gas	20,870	26,330	35,410
Natural Gas Liquids Plants	480	520	710
Refineries	3,200	3,590	5,800
United States	**18,160**	**22,110**	**30,490**
Crude Oil and Natural Gas[1]	**16,630**	**20,030**	**27,410**
Onshore Lower 48	**9,270**	**11,640**	**14,690**
Offshore Lower 48	**4,480**	**5,710**	**9,200**
Alaska	**1,110**	**890**	**1,210**
Natural Gas Liquids Plants	**330**	**330**	**450**
Refineries	**1,200**	**1,750**	**2,630**
Canada	3,340	4,100	5,370
Crude Oil and Natural Gas	2,690	3,490	4,700
Offshore	40	80	200
Onshore	2,650	3,410	4,500
Natural Gas Liquids Plants	150	190	260
Refineries	500	420	410
Mexico	**3,050**	**4,230**	**6,060**
Crude Oil and Natural Gas	**1,550**	**2,810**	**3,300**
Refineries	**1,500**	**1,420**	**2,760**

[1]Components may not equal United States totals due, to estimation techniques employed in the U.S. Department of Commerce/A.P.I. surveys.

1980	1981	1982	1983	1984	1985	1986
			($ million)			
90,240	114,100	115,370	100,860	98,500	91,000	67,280
72,100	90,700	91,410	83,160	83,900	77,370	54,470
1,020	1,220	1,800	810	850	860	510
13,010	15,880	15,860	12,010	11,580	11,190	9,490
710	1,350	2,030	580	120	590	1,230
3,400	4,950	4,270	4,300	2,050	990	1,580
55,930	72,690	67,680	59,190	64,020	59,470	36,110
49,710	64,230	58,820	53,070	57,550	52,430	31,210
1,020	1,220	1,800	810	850	860	510
5,200	7,240	7,060	5,310	5,620	6,180	4,390
40,990	60,260	58,940	50,660	51,770	47,350	27,630
36,990	54,730	52,210	46,260	48,060	43,640	24,830
21,750	33,700	31,390	28,030	29,590	26,370	13,310
10,550	15,840	10,880	10,730	9,560	8,620	5,050
1,550	2,270	4,920	2,930	4,070	2,950	2,020
750	930	1,380	650	680	610	350
3,250	4,600	5,350	3,750	3,030	3,100	2,450
7,220	6,900	6,740	6,600	6,920	7,380	4,980
6,460	5,660	5,070	5,550	6,180	6,690	4,320
300	390	610	1,030	1,080	910	510
6,160	5,270	4,460	4,520	5,100	5,780	3,810
270	290	420	160	170	250	160
490	950	1,250	890	570	440	500
7,720	5,530	2,000	1,930	5,330	4,740	3,500
6,260	3,840	1,540	1,260	3,310	2,100	2,060
1,460	1,690	460	670	2,020	2,640	1,440

3 Capital and Exploration Expenditures 1977 - 86 (continued)

	1977	1978	1979
		($ million)	
Western Europe	**9,040**	**10,210**	**10,700**
Crude Oil and Natural Gas	**7,040**	**7,710**	**8,180**
North Sea Exploration	**960**	**860**	**990**
North Sea Development	**5,510**	**6,110**	**6,270**
Other	**570**	**740**	**920**
Refineries	**2,000**	**2,500**	**2,520**
Central & South America	2,830	3,700	4,940
Crude Oil and Natural Gas	2,170	2,950	3,890
Brazil	720	960	1,180
Colombia	70	110	180
Venezuela	440	690	1,050
Other	940	1,190	1,480
Refineries	660	750	1,050
Far East & Australasia	**3,330**	**3,290**	**4,570**
Crude Oil and Natural Gas	**1,760**	**1,760**	**2,430**
Australia	**170**	**260**	**500**
Indonesia	**940**	**660**	**750**
Other	**650**	**840**	**1,180**
Refineries	**910**	**1,410**	**1,750**
Japan	**470**	**900**	**1,080**
Other	**440**	**510**	**670**
Liquified Natural Gas (LNG) Plants	**660**	**120**	**390**
Middle East & Africa	2,730	2,790	4,220
Crude Oil and Natural Gas	2,290	2,250	3,120
Refineries	440	540	1,100

1980	1981	1982	1983	1984	1985	1986
			($ million)			
13,830	**13,950**	**14,490**	**14,010**	**13,820**	**13,270**	**13,030**
10,450	**10,880**	**11,890**	**11,960**	**12,100**	**11,620**	**11,550**
1,970	**2,360**	**2,960**	**2,860**	**3,180**	**3,380**	**2,810**
7,410	**7,470**	**7,730**	**8,020**	**7,830**	**7,070**	**7,540**
1,070	**1,050**	**1,200**	**1,080**	**1,090**	**1,170**	**1,200**
3,380	**3,070**	**2,600**	**2,050**	**1,720**	**1,650**	**1,480**
6,050	8,410	10,640	8,140	5,730	5,760	5,690
4,760	6,830	8,930	6,920	4,750	4,910	4,870
1,390	2,560	3,580	2,460	1,690	1,680	2,090
230	320	380	280	290	500	200
1,470	2,130	3,120	2,570	1,410	1,350	1,310
1,670	1,820	1,850	1,610	1,360	1,380	1,270
1,290	1,580	1,710	1,220	980	850	820
5,640	**7,550**	**9,330**	**7,370**	**6,600**	**6.510**	**6,770**
3,080	**3,940**	**5,040**	**5,240**	**4,970**	**4,400**	**3,680**
680	**980**	**1,350**	**1,180**	**1,270**	**1,230**	**730**
1,260	**1,460**	**1,720**	**1,480**	**1,290**	**1,180**	**970**
1,140	**1,500**	**1,970**	**2,580**	**2,410**	**1,990**	**1,980**
1,850	**2,260**	**2,260**	**1,550**	**1,510**	**1,520**	**1,860**
960	**1,120**	**860**	**630**	**600**	**610**	**1,000**
890	**1,140**	**1,400**	**920**	**910**	**910**	**860**
710	**1,350**	**2,030**	**580**	**120**	**590**	**1,230**
5,390	6,550	8,960	7,850	6,280	5,000	4,100
4,100	4,820	6,730	5,970	4,530	4,010	3,160
1,290	1,730	2,230	1,880	1,750	990	940

4 United States Crude Oil and Natural Gas Expenditures[1]

	1977	1978 ($ million)	1979
United States — Total	16,630	20,030	27,410
Exploration	7,840	9,460	15,620
Lease Acquisition	2,750	3,080	7,270
Drilling	3,230	4,140	5,620
Other	1,860	2,240	2,730
Production	8,790	10,570	11,790
Drilling	5,660	6,840	7,970
Production Equipment	1,610	2,180	2,150
Other	1,520	1,550	1,670
Onshore Lower 48	9,270	11,640	14,690
Exploration	4,140	5,410	7,390
Lease Acquisition	1,150	1,480	2,290
Drilling	2,120	2,880	3,850
Other	870	1,050	1,250
Production	5,130	6,230	7,300
Drilling	3,830	4,660	5,540
Production Equipment	880	1,030	1,250
Other	420	540	510
Offshore Lower 48	4,480	5,710	9,200
Exploration	2,250	2,900	6,230
Lease Acquisition	1,190	1,580	4,360
Drilling	890	1,090	1,650
Other	170	230	220
Production	2,230	2,810	2,970
Drilling	1,690	1,990	2,170
Production Equipment	510	750	780
Other	30	70	20
Alaska	1,110	890	1,210
Exploration	730	270	810
Lease Acquisition	410	20	610
Drilling	220	170	120
Other	100	80	80
Production	380	620	400
Drilling	140	190	270
Production Equipment	220	400	120
Other	20	30	10

[1]Components may not equal United States totals, due to estimation techniques employed in the U. S. Department of Commerce/A.P.I. surveys.

1980	1981	1982	1983 ($ Million)	1984	1985	1986
36,990	54,730	52,210	46,260	48,060	43,640	24,830
20,830	30,680	27,860	21,090	21,500	16,400	8,470
8,170	13,060	8,620	8,370	8,190	4,420	1,640
8,680	13,550	12,940	7,050	7,360	6,300	3,050
3,980	4,070	6,300	5,670	5,950	5,680	3,780
16,160	24,050	24,350	25,170	26,500	27,240	16,360
10,190	16,110	15,580	18,340	18,690	17,410	9,260
3,570	4,760	5,140	3,700	4,500	5,030	3,530
2,400	3,180	3,630	3,130	3,370	4,800	3,570
21,750	33,700	31,390	28,030	29,590	26,370	13,310
11,240	17,440	15,910	9,420	10,140	8,920	4,510
3,290	5,060	4,460	3,530	3,740	2,880	1,310
6,100	9,760	8,680	3,580	3,980	3,800	1,900
1,850	2,620	2,770	2,310	2,420	2,240	1,300
10,510	16,260	15,480	18,610	19,450	17,450	8,800
7,480	12,360	11,820	15,820	16,280	14,080	6,460
2,120	2,530	2,440	1,880	2,480	2,000	1,460
910	1,370	1,220	910	690	1,370	880
10,550	14,840	10,880	10,730	9,560	8,620	5,050
7,230	10,480	6,420	8,020	6,460	4,150	1,810
4,490	6,490	2,030	4,390	2,850	1,490	280
2,400	3,430	3,850	3,110	3,060	2,150	1,150
340	560	540	520	550	510	380
3,320	4,360	4,460	2,710	3,100	4,470	3,240
2,370	2,950	3,200	2,060	2,030	2,820	2,150
950	1,410	1,260	590	980	1,570	1,030
0	0	0	60	90	80	60
1,550	2,270	4,920	2,930	4,070	2,950	2,020
680	650	2,920	1,150	2,190	610	130
370	20	2,130	450	1,600	50	50
180	350	410	350	330	350	0
130	280	380	350	260	210	80
870	1,620	2,000	1,780	1,880	2,340	1,890
340	790	570	450	380	510	650
510	830	1,430	1,240	1,040	1,460	1,040
20	0	0	90	460	370	200

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